1.0 BACKGROUND INFORMATION

1.1 Location Description and History

The Rio Chama watershed (USGS Hydrologic Unit Code 13020102) is a sub-basin of the Rio Grande Basin, located in north central New Mexico. The entire Rio Chama watershed encompasses 3,150 square miles. For practical purposes, the Rio Chama watershed was divided into upper and lower sampling units. SWQB/NMED defines the Upper Rio Chama watershed as the New Mexico portion of the Rio Chama watershed above El Vado Reservoir. Tributaries in the Upper Rio Chama watershed include Sixto Creek, Nabor Creek, Rio Chamita, Wolf Creek, Little Willow Creek, Cañones Creek, Rio Brazos, Chavez Creek, and Rito de Tierra Amarilla.

The majority of the Upper Rio Chama watershed is within the Tierra Amarilla land grant boundary. The Tierra Amarilla land grant was the largest and most controversial land grant in northwestern New Mexico (Quintana 1991). The first application for the Tierra Amarilla land grant was made by seventy-two Hispanic settlers of the lower Rio Chama valley in 1814 to start a tract of agricultural land primarily to raise sheep. Two other unsuccessful petitions were submitted in 1820 and 1824. In 1832, Manuel Martinez submitted a grant petition on behalf of himself and his family, requesting that access to pastures, roads, and watering places be limited to grantees in an attempt to acquire a private vs. communal grant. The Committee of the Territorial Deputation rejected the request for limited access and made the Tierra Amarilla grant a community grant (Quintana 1991).

There were no permanently inhabited Hispanic settlements in the area until 1860. In the same year, Congress changed the grant from a communal grant to a private grant for Martinez and his descendants. Although deeds supported settlers' claims to their rights on common lands, the grant was signed over to Thomas Benton Catron in 1881, one of the richest landowners in the country (Quintana 1991). In 1901, Catron received patent on the entire grant with small exceptions of the lands allotted to settlers. By 1904, the area between the Village of Chama and Tierra Amarilla was cleared of ponderosa pine by the Southwestern Lumber and Railway Company, leading to subsequent gully erosion and siltation of downstream surface waters (Quintana 1991). The first fences were installed in 1912, depriving settlers of their open range rights. The Alianza was launched in Northern New Mexico in 1966, believing that colonialism had denied them access to the resources of their ancestral lands and had destroyed their communities. They appealed for a Congressional investigation into the circumstances that had lead to this alienation of original land grantees. In 1967, the Alianza attempted a citizen's arrest of a district attorney at the Tierra Amarilla Courthouse. The incident erupted into a shootout, leading to a manhunt for Alianza leader Reies Lopez Tijerina. The episode at the courthouse lead to inquires by the Civil Liberties Union and to a resurrected sense of pride and identity with the land and associated culture (Quintana 1991).

Although the Alianza in now defunct, the issue of land ownership and management in the Tierra Amarilla land grant issue remains alive (Quintana 1991). The Upper Rio Chama watershed is currently dominated by private land with some US Forest Service and state wildlife land (Figure 1.1). Approximately 80 percent of the Upper Rio Chama watershed is private, the Forest Service manages 5 percent, 15 percent is managed by the State of New Mexico as the Edward Sargent

Fish and Wildlife Area. A large portion of the Little Willow Creek watershed is owned and managed by the Jicarilla Apache Tribe. Primary land uses in the Upper Rio Chama watershed include ranching, agriculture, gravel mining, silvaculture, recreation and tourism, and limited urban development. There are two permitted point sources in the Upper Rio Chama basin: The Village of Chama Wastewater Treatment Plant (NPDES Permit No. NM0027731) and the New Mexico Department of Game and Fish Parkview Fish Hatchery (NPDES Permit No. NM0030139). There are several active and abandoned gravel mines throughout the watershed. There are several active irrigation canals throughout the Upper Rio Chama watershed that divert surface water from streams to agricultural and rangeland fields. The main population centers are the Village of Chama and Tierra Amarilla. The Upper Rio Chama watershed was intensively sampled in 1998. Select follow-up monitoring was completed in 2002.

Precambrian sedimentary rocks form the Brazos Cliffs in the eastern portion of the Upper Rio Chama watershed (Figure 1.2 and Table 1.1). The Brazos Box is a dramatic 2000-foot-deep cliff-walled canyon that is three times deeper than the Rio Grande gorge near Taos. Small cinder cones are sources for lava that flowed down the Brazos Box into the Rio Chama basin to the west of Tierra Amarilla approximately 250,000 years ago. In places on these western slopes, glacial gravels overlie Mancos shale that is a particularly weak Cretaceous rock unit that is slippery when wet. Road construction through these areas has led to landslides over the years (Chronic 1987). The name Tierra Amarilla refers to the yellowish soil derived from Mancos shale. West of the Village of Chama off State Highway 64, the Mancos shale bluffs are capped with Mesa Verde group sandstone and shale. The Mancos shale floors the Chama syncline that extends to the south. The Cumbres Mountains to the north are composed of Precambrian granite and Tertiary volcanic rocks (Chronic 1987).

Table 1.1 Geologic unit definitions

Geologic Unit Code	Definition
J	Jurassic rocks, Middle and Upper, undivided
Jm	Morrison Formation; Upper Jurassic nonmarine rocks present only in northern one-third of state
Kd	Dakota Sandstone; includes Oak Canyon, Cubero, and Paguate Tongues plus Clay Mesa Tongue of Mancos Shale
Kl	Lower Cretaceous, undivided; in northern Lea and Roosevelt Counties includes equivalents of Tucumcari Shale
Km	Mancos Shale; divided into Upper and Lower parts by Gallup Sandstone
Kmv	Mesa Verde Group includes the Gallup Sandstone, Crevasse Canyon Formation
Pc	Castile Formation; dominantly anhydrite sequence; Upper Permian
Qb	Quaternary Basalt and andesite flows and locally vent deposits
Ql	Quaternary Landslide deposits and colluvium
Qm	Quaternary Moranil
Tbb	Tertiary Basalt
Tca	Carson conglomerate
Tp	Tertiary pediment deposit
TR	Triassic rocks, general

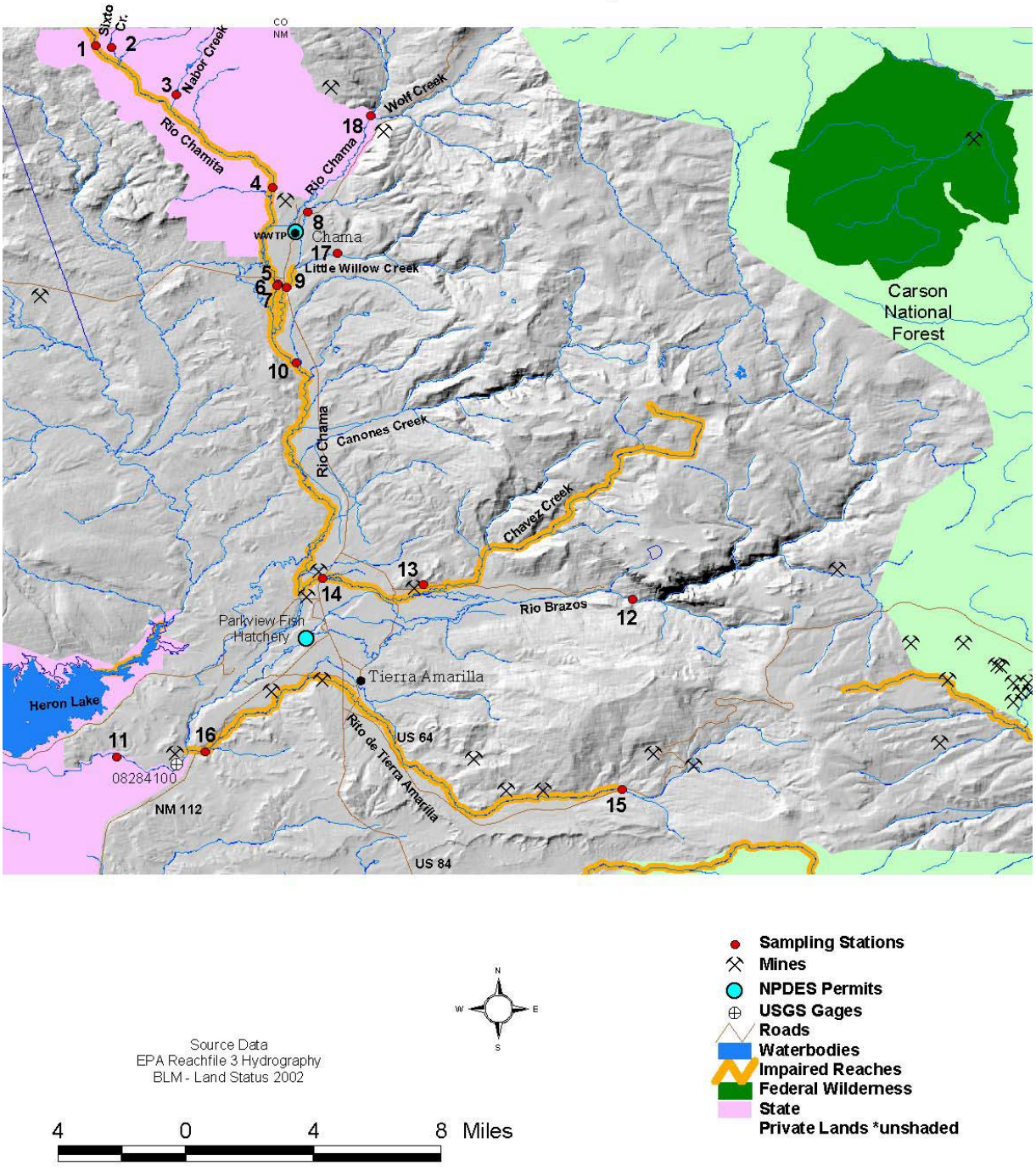

Figure 1.1 Upper Rio Chama Land Ownership and SWQB Sampling Stations

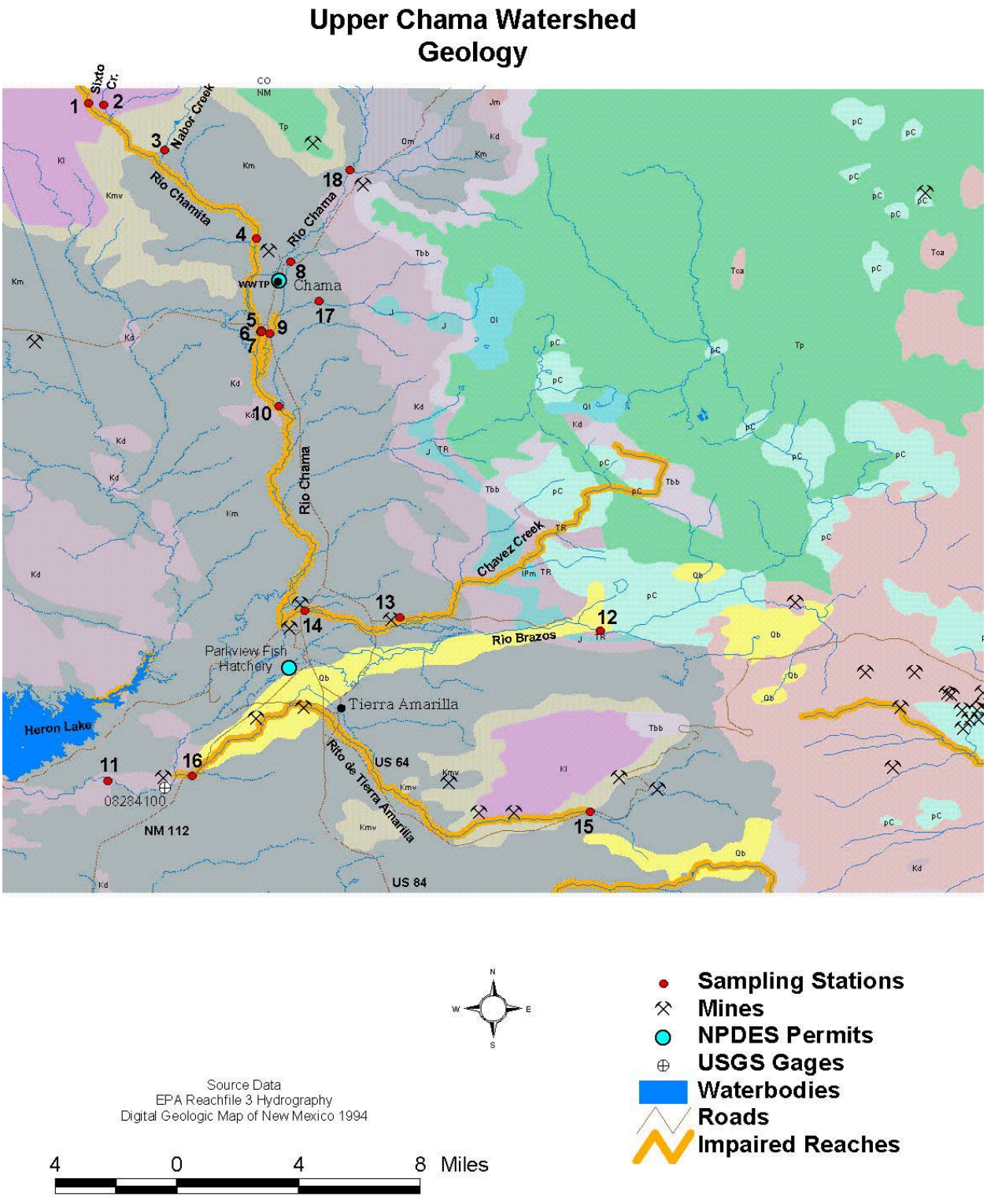

Figure 1.2 Upper Rio Chama Geology

1.2 Water Quality Standards

Water quality standards (WQS) for all assessment units in this document are set forth in sections 20.6.4.119 and 20.6.4.900 of the 2001 New Mexico Standards for Interstate and Intrastate Surface Waters (NMAC 20.6.4). NMAC 20.6.4.119 reads as follows:

> **RIO GRANDE BASIN**-All perennial reaches of tributaries to the Rio Chama above Abiquiu dam except the Rio Gallina and Rio Puerco de Chama north of state highway 96 and the main stem of the Rio Chama from the headwaters of El Vado reservoir upstream to the New Mexico-Colorado line.
>
> **A. Designated Uses**: domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, and secondary contact.
>
> **B. Standards**:
>
> (1) In any single sample: conductivity shall not exceed 500 µmhos (1,000 µmhos for Coyote Creek), pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20 ºC (68 ºF), and turbidity shall not exceed 25 NTU. The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to designated uses listed above in Subsection A of this section.
>
> (2) The monthly geometric mean of fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Subsection B of 20.6.4.13 NMAC.

1.3 Intensive Water Quality Sampling

The Upper Rio Chama watershed was intensively sampled by SWQB/NMED in 1998. Water quality samples were collected during spring (June 1-4), summer (August 18-19), and fall (October 20-21). Select follow-up monitoring was completed in October 2001 and June – September 2002. Surface water quality monitoring stations were selected to characterize water quality of the stream reaches (Table 1.2, Figure 1.1). Stations were located to evaluate the impact of tributary streams and to establish background conditions. Due to the large percentage of private land in the Upper Rio Chama watershed, selection of sampling stations was often limited to road/bridge right-of-way locations. The results of the survey were summarized in a water quality survey report (SWQB/NMED 2001a).

Table 1.2 SWQB/NMED 1998 Upper Rio Chama Sampling Stations

SWQB Station	STORET Reference	Station Location
1	URG116.020055	Rio Chamita upstream of confluence with Sixto Creek
2	URG116.020050	Sixto Creek upstream of confluence with Rio Chamita
3	URG116.020044	Nabor Creek upstream of confluence with Rio Chamita
4	URG116.020035	Rio Chamita at State Highway 29
5	URG116.020015	Rio Chamita above Village of Chama WWTP
6	URG116.020010	Village of Chama WWTP effluent discharge
7	URG116.020005	Rio Chamita downstream of the Village of Chama WWTP outfall
8	URG116.020510	Rio Chama upstream of the Village of Chama at State Highway 17
9	URG116.020505	Rio Chama at State Highway 84
10	URG116.019550	Rio Chama at NMG&F access downstream of confluence with Rio Chamita
11	URG116.016533	Rio Chama 2 miles downstream of the USGS gaging station at La Puente
12	URG116.018040	Rio Brazos upstream of Corkin's Lodge
13	URG116.018022	Chavez Creek upstream of confluence with Rio Brazos at County RD 512
14	URG116.008005	Rio Brazos at State Highway 84
15	URG116.017066	Rio Tierra Amarilla at State Highway 64
16	URG116.017005	Rito de Tierra Amarilla at State Highway 112
17	URG116.020506	Little Willow Creek upstream of confluence with Rio Chama
18	URG116.020570	Wolf Creek at State Highway 17

There is one active USGS gaging station in the Upper Rio Chama watershed: USGS 08284100 Rio Chama Near LaPuente, New Mexico (Figure 1.1). Minimum, mean, and maximum stream flows at this station are 11 cfs, 104 cfs, and 809 cfs, respectively, based on 46 years of record (1955 – 2001).

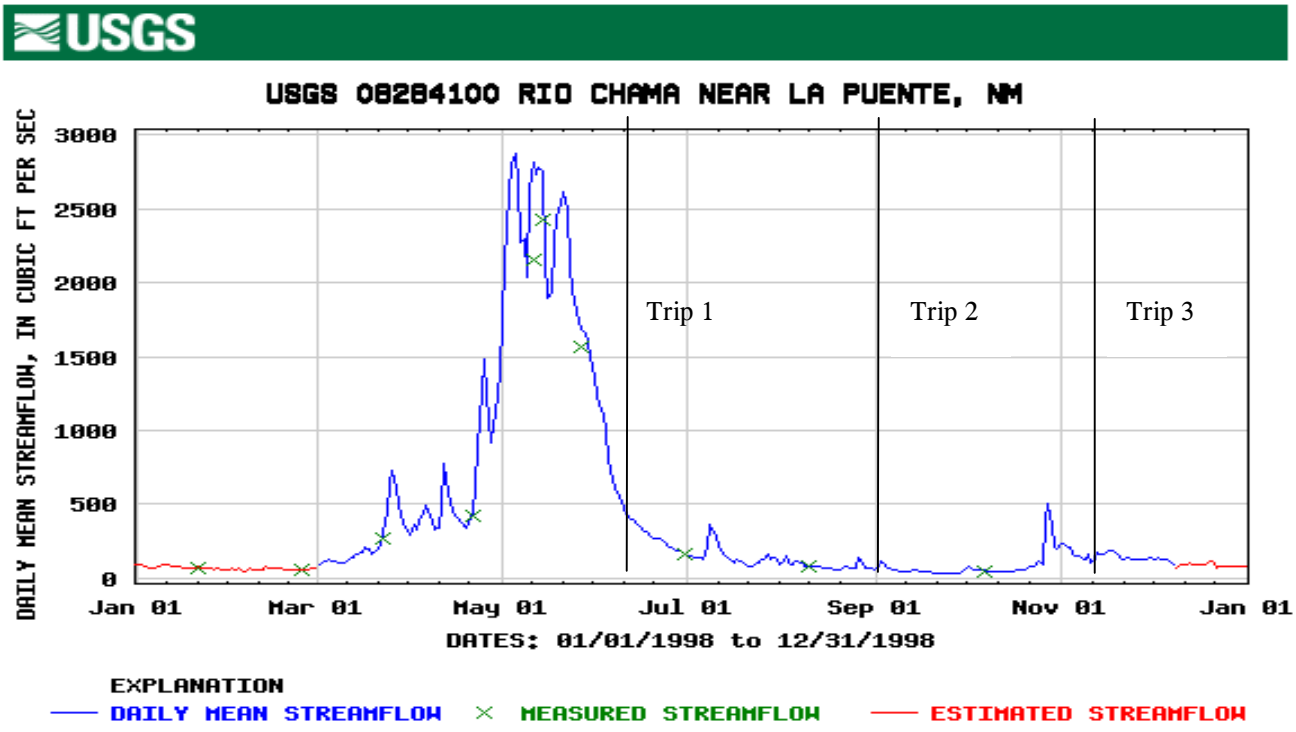

Figure 1.3 Daily flow of the Rio Chama Near LaPuente during the 1998 calendar year

All temperature, chemical/physical, and stream bottom deposits sampling and assessment techniques are detailed in the Quality Assurance Project Plan (SWQB/NMED 2001b). As a result of 1998 monitoring effort and subsequent assessment of results, several exceedences of New Mexico water quality standards for several streams were documented. Accordingly, these impairments were added to New Mexico's Clean Water Act §303 (d) list. This TMDL document addresses each assessment unit by constituent (or pollutant) whose standard(s) have been exceeded.